Office Action Summary	**Application No.** 10/565,101	**Applicant(s)** ISHIKAWA ET AL.	
	Examiner AMANDA BARROW	**Art Unit** 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,13-15 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,13-15 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Application

1. The Applicant's amendment filed on 5/10/2010 was received. Claims 1, 8 and 13-15 have been amended. Claims 10-12 have been cancelled.

2. The texts of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on 1/16/2009.

Claim Objections

3. Claims 13 and 14 are objected to under 37 CFR 1.75 as being duplicates of claims 5 and 6, respectively. Claims 13 and 14 no longer depend from cancelled claim 10 and now depend from claim 4 from which claims 5 and 6 also depend, and thus, the dependency and the scope (the claims are identical) are the same and the claims are objected to as being duplicates.

Claim Rejections - 35 USC § 102

4. The claim rejections under 35 U.S.C. 102(b) as being anticipated by Sugiura et al. (US Patent Application 2003/0118876 A1) on claims 10-17 are withdrawn as the claims have been amended or cancelled.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-9, 13-15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al. (US Patent Application 2003/0118876 A1).

Regarding claim 1, Sugiura teaches a fuel cell system (22) including a fuel cell (60), electric power storing device (capacitor 24), and electric power supplying device (power supply apparatus 15) for supplying electric power to a load (high-voltage auxiliary machine 40 and motor 32) from the fuel cell (60) and the electric power storing device (capacitor 24) as is illustrated in Figures 1 and 2 (see paragraphs 36, 37, 71 and 72). Sugiura discloses that drive motor 32 ("load") receives electric power from the power supply apparatus 15 (paragraph 42).

The electric power supply device (power supply apparatus 15) includes intermittent operation means (FC suspend mode or "intermittent operating mode" – paragraphs 54-55) for stopping operation of the fuel cell (60) when an amount of driving power required by the load is smaller than a reference value (reference voltage value V_0 - paragraph 59):

> "…when the load for which electric power is supplied from the power supply apparatus 15 is lower than a predetermined limit [V_o], control is performed to stop the generation of electric power by the fuel cell 60" (paragraph 55; also see paragraphs 58-62).

The electric power supply device (power supply apparatus 15) has the ability to start the stopped operation of the fuel cell (60) when the amount of driving power required by the load is equal to or larger than the reference value (reference voltage value V_0 - paragraph 59):

> "Figure 6 shows variations of the fuel cell 60 output voltage and the capacitor 24 voltage when the mode is switched back and forth between normal operating mode and the FC suspend mode" (paragraph 62; also see paragraphs 45-61).

The reference value (V_0) (i.e, the "threshold value") is stored beforehand in the controller 48 (paragraph 59); however, V_0 may be adjusted by controller 48 ("threshold value adjusting device") (paragraphs 44, 78, and 81). V_0 is adjustable in accordance with the rate of increase (dV_c/dt) in the capacitor voltage in the embodiment (paragraph 80). However, the reference teaches that the reference value V_0 for use in the operating mode switching may be adjusted in accordance with a rate of change of an index that is different from the index which is to be compared with the reference value (paragraph 113). For example, the reference voltage V_1 (analogous to V_0) may be adjusted based on a rate of change of the output power level of the power supply apparatus according to their preset relationship, and the reference voltage V_1 may be compared with the capacitor voltage V_c (paragraph 113). The "preset relationship" of the power supply apparatus is equivalent to dP_{fc}/dt (rate of change of the output power level of the fuel cell) & dP_c/dt (rate of change of the output power level of the capacitor) as the power supply apparatus includes both the fuel cell and the capacitor (paragraphs 37 and 71).

Therefore, as the reference voltage V_1 may be adjusted according to a rate of change of the output power level of the power supply apparatus (i.e, the change of the output power level

of both the fuel cell and capacitor), and the rate of change of the output power level is directly related to the rate of change of output power voltage [$dP_{fc}/dt = (dV_{fc}/dt) * (dI_{fc}/dt)$], and the rate of change of the output voltage (dV_{fc}/dt) is dependent directly on the actual output voltage of the fuel cell V_{fc} (dV_{fc}/dt is derived from the tangent line drawn from two points of the graph of voltage versus time), it would have been obvious to a person of ordinary skill in the art to adjust the reference value according to the output voltage of the fuel cell because Sugiura discloses that the reference value may be adjusted in accordance with a rate of change of an index that is different form the index which is to be compared with the reference value and teaches that the reference voltage may be adjusted based on a rate of change of the output power level of the power supply apparatus (i.e, the fuel cell and capacitor), and as documented above, the rate of change of the output power level of the power supply apparatus is directly related to the output voltage of the fuel cell.

Furthermore, the object of Sugiura's invention is to prevent the reduction of the energy efficiency of the power supply apparatus due to a drop in the energy efficiency of the fuel cell system (paragraph 7). As illustrated in Figures 3, 4A, and 4B, when the output from the fuel cell 60 is small, the energy efficiency of the fuel system 22 as a whole declines, and a drop in energy is prevented by adopting the FC suspend mode in which the operation of the fuel cell 60 is stopped when the load is low, i.e., when the efficiency of the fuel cell system 22 as a whole is poor (paragraphs 56 and 57). As documented in the third embodiment (paragraphs 78-96), the reference voltage V_1 becomes larger as the capacitor voltage rate of increase falls, i.e., as the load demand increases and the discharge from the capacitor increases (paragraph 83). Analogously, if the reference value is adjusted according to the rate of change of the output

power level of the power supply apparatus (and thus, the output voltage of the fuel cell) as indicated in paragraph 113, it would have been obvious to a person of ordinary skill in the art to adjust the reference value so that it increases as the output voltage of the fuel cell increases or alternatively, decreases as the output voltage of the fuel cell decreases, in order to maximize the energy efficiency of the fuel cell system as taught by Sangiura (paragraphs 7, 83 and 90).

Regarding claim 8, Sugiura teaches an electric vehicle (10) including a motor (32) that generates power for the vehicle and a fuel cell system (22) that includes a fuel cell (60), electric power storing device (capacitor 24), and an electric power supplying device (power supply apparatus 15) for supplying a driving power to the motor (32) from a fuel cell (60) and the electric power storing device (capacitor 24) as shown in Figure 1 (see paragraphs 36, 37, 71 and 72). Sugiura discloses that drive motor 32 ("load") receives electric power from the power supply apparatus 15 (paragraph 42). The remainder of the claim is identical to claim 1 so please see the arguments regarding the rejection of claim 1 for the remaining rejection of claim 8.

Regarding claim 2, Sugiura discloses that the threshold value adjusting means (controller 48) may adjust the reference value V_0 according to a rate of change of the output power level of the power supply apparatus (paragraph 113), and thus, the output power voltage of the fuel cell, as established in the rejection of claim 1 (see arguments above). The rejection of claim 1 also established the obvious modification of decreasing the reference value according to a decrease in the voltage ("internal electromotive force") in the fuel cell to increase efficiency. As the reference value, which dictates when the fuel cell switches from suspend mode to normal mode (paragraph 79), is decreased when the voltage decreases, this causes the time at which the operation of the fuel cell is switched from the suspend mode to normal mode (i.e., the time at

which the fuel cell is started) to be advanced. This is analogous to when the reference value is adjusted according to the rate of increase in the capacitor voltage as this causes the operating mode to be switched to the normal operating mode more quickly in order to prevent an excessive drop in the fuel cell output voltage (paragraphs 90 and 92).

Regarding claim 3, Sugiura teaches that the threshold value adjusting means (control portion 48) stores data related to the reference value as Sugiura discloses that the controller 48 constitutes a ROM on which is stored control programs and control data necessary for execution of the various calculation processes by the CPU (paragraph 44). The reference value V_0 is set according to the voltage in the fuel cell as the system switches from suspend to normal based on the efficiency of the fuel cell which is dictated by the voltage output required by the fuel cell (see Figures 3, 4A, 4B and paragraphs 55-59).

Regarding claims 4 and 9, Sugiura teaches that the reference value V_0 may include a first reference value (V_1) and second reference value (V_2) that is larger than the first value and the intermittent operation means stops the operation of the fuel cell (30) when the amount of driving power required by the load is smaller than the first reference value (V_1) and starts the stopped operation of the fuel cell when the amount of driving power required by the load is equal to or larger than the second reference value (V_2):

> "Figure 8 shows two different reference voltages for use in the determination of switching between the intermittent driving mode and the FC suspend mode. In this embodiment, the first reference voltage V_1 used when the mode is to be switched from the FC suspend mode to the normal operating mode is set to be lower than the second reference voltage V_2 used when the mode is to be switched from the normal operating mode to the FC suspend mode" (paragraph 79).

Figure 8 illustrates the reference values being adjusted according to the rate of increase in the capacitor voltage (dV_c/dt) during a time when the fuel cell operation has been stopped

(paragraph 80-96); however, as established in the rejection of claims 1 and 8, the reference values may be adjusted according to the output voltage of the fuel cell (i.e., "the internal electromotive force in the fuel cell") whose operation has been stopped (paragraphs 95 and 113).

Regarding claims 5 and 13, Sugiura discloses that the threshold value adjusting means (controller 48) may adjust the reference value(s) according to a rate of change of the output power level of the power supply apparatus (paragraph 113), and thus, the output power voltage of the fuel cell, as established in the rejection of claims 1 and 8 (see arguments above). The rejection of claim 1 also established the obvious modification of decreasing the reference values according to a decrease in the voltage ("internal electromotive force") in the fuel cell to increase efficiency. As the reference values, which dictates when the fuel cell switches from suspend mode to normal mode (paragraph 79), are decreased when the voltage decreases, this causes the time at which the operation of the fuel cell is switched from the suspend mode to normal mode (i.e., the time at which the fuel cell is started) to be advanced. This is analogous to when the reference values are adjusted according to the rate of increase in the capacitor voltage as this causes the operating mode to be switched to the normal operating mode more quickly in order to prevent an excessive drop in the fuel cell output voltage (paragraphs 90 and 92).

Regarding claims 6 and 14, Sugiura teaches that the threshold value adjusting means (control portion 48) stores data related to the reference value as Sugiura discloses that the controller 48 constitutes a ROM on which is stored control programs and control data necessary for execution of the various calculation processes by the CPU (paragraph 44) and that the second reference voltage value V_2 is stored in the controller 48 and may be adjusted (paragraphs 86 and 95). The reference value V_2 is set according to the voltage in the fuel cell as the system switches

from suspend to normal based on the efficiency of the fuel cell which is dictated by the voltage output required by the fuel cell (see Figures 3, 4A, 4B and paragraphs 55-59 and 79).

Regarding claims 7 and 15, Sugiura discloses that the "electric power storing device" comprises a capacitor (24) (paragraph 37) and that the system may include a secondary battery 26 in embodiment 1 (paragraphs 36-37).

Regarding claim 17, Sugiura discloses that the threshold value adjusting means (controller 48) may adjust the reference value(s) according to a rate of change of the output power level of the power supply apparatus (paragraph 113), and thus, the output power voltage of the fuel cell, as established in the rejection of claims 1and 8 (see arguments above). Furthermore, the object of Sugiura's invention is to prevent the reduction of the energy efficiency of the power supply apparatus due to a drop in the energy efficiency of the fuel cell system (paragraph 7). As illustrated in Figures 3, 4A, and 4B, when the output from the fuel cell 60 is small, the energy efficiency of the fuel system 22 as a whole declines, and a drop in energy is prevented by adopting the FC suspend mode in which the operation of the fuel cell 60 is stopped when the load is low, i.e., when the efficiency of the fuel cell system 22 as a whole is poor (paragraphs 56 and 57). As documented in the third embodiment (paragraphs 78-96), the reference value V_2 becomes larger as the capacitor voltage rate of increase falls, i.e., as the load demand increases and the discharge from the capacitor increases as V_2 must be larger than V_1 in order to avoid "hunching" (paragraphs 83 and 95). Analogously, if the reference value is adjusted according to the rate of change of the output power level of the power supply apparatus (and thus, the output voltage of the fuel cell) as indicated in paragraph 113, it would have been obvious to a person of ordinary skill in the art to adjust the reference value so that it increases as

the output voltage of the fuel cell increases in order to maximize the energy efficiency of the fuel cell system and to maintain V_2 at a higher value than V_1 to avoid the occurrence of "hunching" (paragraphs 7 and 90).

Response to Arguments

7. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's remaining principal arguments are

(a) The Applicants submit that claim 1 is patentable over the cited references at least because it recites, in part, "a threshold value adjusting device for adjusting a reference value according to an output voltage of the fuel cell, such that the reference value decreases as the output voltage of the fuel cell decreases." As shown in Figure 8 of the reference, Sugiura teaches adjusting the reference voltage based on the rate of increase of the voltage of the capacitor (dVc/dt).

In response to Applicant's arguments, please consider the following comments.

(a) The reference value (V_0) (i.e, the "threshold value") is stored beforehand in the controller 48 (paragraph 59); however, V_0 may be adjusted by controller 48 ("threshold value adjusting device") (paragraphs 44, 78, and 81). V_0 is adjustable in accordance with the rate of increase (dV_c/dt) in the capacitor voltage in the embodiment shown (paragraph 80). However, the reference teaches that the reference value V_0 for use in the operating mode switching may be

adjusted in accordance with a rate of change of an index that is different from the index which is to be compared with the reference value (paragraph 113). For example, the reference voltage V_1 (analogous to V_0) may be adjusted based on a rate of change of the output power level of the power supply apparatus according to their preset relationship, and the reference voltage V_1 may be compared with the capacitor voltage V_c (paragraph 113). The "preset relationship" of the power supply apparatus is equivalent to dP_{fc}/dt (rate of change of the output power level of the fuel cell) & dP_c/dt (rate of change of the output power level of the capacitor) as the power supply apparatus includes both the fuel cell and the capacitor (paragraphs 37 and 71).

Therefore, as the reference voltage V_1 may be adjusted according to a rate of change of the output power level of the power supply apparatus (i.e, the change of the output power level of both the fuel cell and capacitor), and the rate of change of the output power level is directly related to the rate of change of output power voltage [$dP_{fc}/dt =(dV_{fc}/dt) * (dI_{fc}/dt)$], and the rate of change of the output voltage (dV_{fc}/dt) is dependent directly on the actual output voltage of the fuel cell V_{fc} (dV_{fc}/dt is derived from the tangent line drawn from two points of the graph of voltage versus time), it would have been obvious to a person of ordinary skill in the art to adjust the reference value according to the output voltage of the fuel cell because Sugiura discloses that the reference value may be adjusted in accordance with a rate of change of an index that is different form the index which is to be compared with the reference value and teaches that the reference voltage may be adjusted based on a rate of change of the output power level of the power supply apparatus (i.e, the fuel cell and capacitor), and as documented above, the rate of change of the output power level of the power supply apparatus is directly related to the output voltage of the fuel cell.

Furthermore, the object of Sugiura's invention is to prevent the reduction of the energy efficiency of the power supply apparatus due to a drop in the energy efficiency of the fuel cell system (paragraph 7). As illustrated in Figures 3, 4A, and 4B, when the output from the fuel cell 60 is small, the energy efficiency of the fuel system 22 as a whole declines, and a drop in energy is prevented by adopting the FC suspend mode in which the operation of the fuel cell 60 is stopped when the load is low, i.e., when the efficiency of the fuel cell system 22 as a whole is poor (paragraphs 56 and 57). As documented in the third embodiment (paragraphs 78-96), the reference voltage V_1 becomes larger as the capacitor voltage rate of increase falls, i.e., as the load demand increases and the discharge from the capacitor increases (paragraph 83). Analogously, if the reference value is adjusted according to the rate of change of the output power level of the power supply apparatus (and thus, the output voltage of the fuel cell) as indicated in paragraph 113, it would have been obvious to a person of ordinary skill in the art to adjust the reference value so that it increases as the output voltage of the fuel cell increases or alternatively, decreases as the output voltage of the fuel cell decreases, in order to maximize the energy efficiency of the fuel cell system (paragraphs 7 and 90).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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